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Application of Effective Microorganisms™ (EM) technology contributes to the reconstruction of a cycle based dairy farm in Fukushima (A case study)

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1. Background

Takizawa Dairy Farm (Minamisoma-shi, Fukushima) is located 21km from the Fukushima Daiichi nuclear power plant. Before the nuclear accident, they were operating a cycle based farm in which, they were using manure (farmyard manure and farm slurry) from the cattle barn. They grew oats and Italian rye grass, then fed these grass to their cattle. However, after the nuclear accident, shipments of milk from Fukushima were suspended. Moreover, 100% of the self-supplied grazing pasture was polluted with radioactive cesium and Takizawa Dairy Farm was forced to buy imported meadow grass which put pressure on their operation. Therefore, from early on, their aim was to resume production of safe pasture based milk production. They were surveying radioactive cesium and were using decontamination techniques such as reversal tillage. Effective Microorganisms™ (EM) technology is reported to have an effect on the suppression of radioactive cesium transfer from soil to plant, as well as improving the rearing environment, increase the health and hygiene of livestock, augmenting milk quality, and making more effective use of manure. Therefore, together with Mr. Takizawa, we introduced EM technology® to the Takizawa Dairy Farm, aiming to suppress transfer of radioactive cesium from soil to grass, reduce the level of radioactive cesium in milk, improve milk quality and improve livestock barn environment (odor and flies, etc.) .

2. Methods

EM･1® consists of a wide variety of effective and beneficial microorganisms such as lactic acid bacteria, yeast and phototrophic bacteria. In Japan, EM･1® is registered and widely used as soil improvement agent and feed additives. At Takizawa Dairy Farm, we expand EM culture using molasses and added EM･1® to coarse feed (home grown feed and purchased feed) and to fermented total mixed ration, spraying EM over the barn floor and mixing EM into animal drinking water. Slurry and cattle dung was spread on pasture after the fermentative treatment. In order to evaluate the effect, we measured the radioactive cesium level in soil, in pasture and in milk and measured somatic cell count in milk on a regular basis. Also, we interviewed Mr. Takizawa.

3. Results and Discussion

The radioactive cesium level on the tested meadow soil was 3,000～3,500Bq/kg (as of September, 2012). In the EM added area where EM-fermented cow manure compost and slurry were applied, the radioactive cesium level and the transfer coefficients for oats and Italian rye grass tended to be lower than in chemical added area. This enabled Takizawa Dairy Farm to use their self-produced grass for coarse feed again. By April 2014, the radioactive cesium level in the soil did not change much in the chemical added area, whereas it gradually decreased in the EM added area. After spraying EM, the environment in the cattle barn was also improved. Foul smells and the number of flies decreased. According to Mr. Takizawa, the improvement in the environment reduces the stress on dairy cows, resulting in the decrease of the disease rate. Not only raw milk complies with national safety standard（50Bq/kg,）but radioactive cesium was

undetectable (minimum detectable value 1Bq/kg). The quality of milk is also stable with somatic cell count less than $2x10^5$/ml. Bacterial count, fat (%) and solid non-fat (%) also meet the standards. Milking performance that decreased to 7,200kg/head/year right after the earthquake, recovered to 9,000kg/head/year.

4. Conclusion

Now, Mr. Takizawa explores the EM technology® application on his own, as well as voluntarily supports neighboring dairy farmers in utilizing EM technology®. Above results prove that EM technology® is able to contribute to the restoration of original cycle based dairy husbandry in Fukushima.